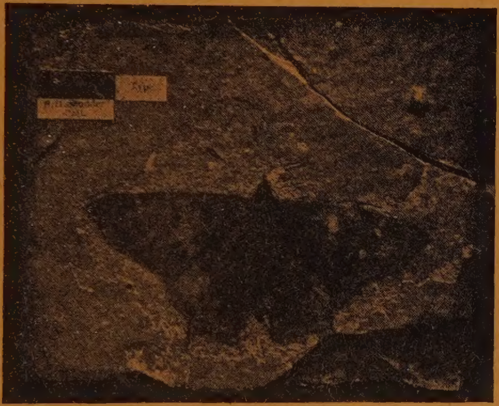
PSYCHE

A JOURNAL OF ENTOMOLOGY

ESTABLISHED IN 1874

VOL. XXIV DECEMBER, 1917 NUMBER 6



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CONTENTS.

The Temporary Social Parasitism of *Lasius subumbratus* Viereck. *W. M. Wheeler* . . . 167
Notes on the Marriage Flights of Some Sonoran Ants. *W. M. Wheeler* 177
The Pleometrosis of Myrmecocystus. *W. M. Wheeler* 180
The Distribution of the Nose Fly and Other Species of Gastrophilus in the United States. *F. C. Bishopp* 182
Preliminary Experiments with Sodium Fluoride and Other Insecticides Against Biting and Sucking Lice. *F. C. Bishopp* and *H. P. Wood* 187
Geometrid Notes. *L. W. Swett* 190
Note on the Ichneumonid Genera Cyanocryptus and Lamprocryptus. *C. T. Brues* . . 191
Note on the Adult Habits of Some Hymenopterous Parasites of Orthoptera and Mantoidea. *C. T. Brues* 195
Exchange Column 197
Index to Volume XXIV 199

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PSYCHE

VOL. XXIV DECEMBER, 1917 No. 6

THE TEMPORARY SOCIAL PARASITISM OF LASIUS SUBUMBRATUS VIERECK.[1]

By William Morton Wheeler.

During the past summer, while studying the ants of the Sacramento Mountains, at Cloudcroft, N. M. (alt. 9,000 ft.), I had an opportunity to observe the method of colony formation employed by *Lasius* (*Formicina*) *umbratus* Nyl. subsp. *subumbratus* Viereck. *L. umbratus* has long been known as a circumpolar species comprising several races, or subspecies and varieties, the names and known geographical distribution of which are recorded in the following list:

Palearctic Forms.

L. umbratus subsp. *umbratus* Nyl.	Northern and Alpine Eurasia from Britain to Japan.
subsp. *mixtus* Nyl.	
var. *mixto-umbratus* Forel	
var. *umbrato-affinis* Ruzsky	Russia.

Nearctic Forms.

subsp. *mixtus* var. *aphidicola* Walsh	Canada, Central and Atlantic States.
subsp. *subumbratus* Viereck	British America, Rocky Mts.
subsp. *speculiventris* Emery	Known only from New Jersey.
subsp. *vestitus* Wheeler	Known only from Idaho.
subsp. *minutus* Emery	Central and Atlantic States.

In Europe, according to Wasmann and Donisthorpe, the var. *mixto-umbratus* is more common than the typical *umbratus* or *mixtus*, between which it is intermediate in size, color and pilosity. In the Eastern United States *aphidicola* is certainly the most abundant form of *umbratus*. The subspecies *speculiventris* and *vestitus* are imperfectly known, the latter from a single female specimen, the former only from the types taken many years ago by Pergande at Caldwell, N. J. The subspecies *minutus* is very sporadic. During the past eight years I have found only a single colony of it in the vicinity of Boston. The types of the subspecies *subumbratus* were taken by Professor Cockerell at Beulah, N. M. (alt. 8,000 ft.). I have taken it at Williams, and on Mt. Lemmon in the Santa Catalina Range (9,000 ft.), Ariz., at Cloudcroft, N. M. (9,000 ft.), Lake Tahoe, Calif. (8,000 ft.), near Ottawa, Ontario, and Hull, Quebec and have seen specimens from Digby and Bedford, Nova Scotia. It is therefore the most boreal and stenothermal of all the North American subspecies of *umbratus* and, as I have stated in a former paper (1917), properly belongs to the Canadian zone.

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[1] Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University. No. 136.

To the ethologist *umbratus* is of unusual interest, because in Europe it is a temporary parasite of *L. niger* and in turn serves as the host of *L.* (*Dendrolasius*) *fuliginosus*, which is therefore a true temporary social hyperparasite. The young *umbratus* queen is adopted by a colony of *niger* workers, which bring up her brood. Eventually these workers die off, probably in the course of four or five years, and the *umbratus* colony, now pure, becomes very populous. Then it may in turn adopt a queen of *fuliginosus*, the offspring of which eventually supplant the *umbratus* colony. In both cases the host queens are eliminated, probably by being assassinated either by their own workers or by the parasitic queens. The various phases in the development of the *umbratus* and *fuliginosus* colonies have been studied by European myrmecologists. The occasional occurrence of mixed colonies of *umbratus* and *niger* and *umbratus* and *fuliginosus* was noted by Schenck, Adlerz, Forel, Wasmann and de Lannoy, but Emery and Forel in 1908 first suggested that they might be interpreted as arising from temporary social parasitism. Later Crawley and Donisthorpe fully demonstrated the truth of this conjecture by showing that the typical *umbratus* is parasitic on the typical *niger*, the subspecies *mixtus* on the subspecies *alienus*, and that *umbratus* regularly functions as the temporary host of *fuliginosus*.

Although North America is so rich in *umbratus* forms, no one has hitherto been able to prove from observations in the field that any of them is parasitic on some one of our varieties of *L. niger*. I have repeatedly found deälated queens of *aphidicola* in small cavities under stones as if in the act of founding colonies independently in the same manner as most ants, but never with brood. Nor have I ever been able to find a mixed colony of *L. niger* var. *americanus* and *aphidicola*, even in Illinois where both forms are common in the same localities. The only indication that any American form of *umbratus* may be a social parasite is furnished by some specimens of *subumbratus* collected by Mr. W. Reiff in Nova Scotia and some experiments by Tanquary on *minutus*. At Bedford, near Halifax, Mr. Reiff took six deälated *subumbratus* queens from three colonies of what I recorded at the time (1910) as "the large yellowish form of *Lasius niger* var. *neoniger* Emery." Since the discovery of Pergande's types of Alaskan ants I can now state definitely that this variety is *sitkaësis*. As Reiff's specimens were not accompanied by notes, the parasitism of *subumbratus* could only be conjectured. Tanquary introduced successively some eighty-eight of the small, active queens of *minutus* into twenty different colonies of *L. americanus, nearcticus, brevicornis, claviger* and *interjectus* and obtained one case of adoption. This was in a colony of eight workers and a large number of cocoons of *americanus*. He concludes that "although one adoption out of 88 attempts is a small percentage, yet I think the ease with which this queen was adopted is very suggestive, and taken together with the facts mentioned above, namely the sporadic occurrence of the species, the very large number of females produced, the small size of the females, the fact that these females have not been seen in the act of founding a colony and one additional fact that may be mentioned, the mimetic coloration of the females (the color of these females is exactly the same as that of the darker form of *americanus*), I think justifies us in concluding that the queen of this species is in all probability, temporarily, parasitic upon the common *L. americanus*."

My observations at Cloudcroft leave no doubt concerning the parasitism of the subspecies *subumbratus* on two forms of *L. niger*, the var. *sitkaënsis* Pergande and the var. *neoniger* Emery. The former, as I have recently shown (1917), is the common form of *niger* at higher altitudes and latitudes from Alaska to Maine and Nova Scotia and southward along the ranges of the Sierra Nevada and Rocky Mountains. The worker and female of this variety are large, brown or yellowish brown, with numerous erect or suberect hairs on the legs and antennal scapes. It passes over into the var. *neoniger*, which is smaller and darker, but has hairy legs and scapes, unlike our common and more xerothermic var. *americanus*, which closely resembles the European *alienus* in having the legs and scapes merely finely pubescent. At Cloudcroft *sitkaënsis* is everywhere abundant in the pine forests at an altitude of 9,000 to 9,500 feet, and nests by preference under large stones. The females and workers have a peculiar and rather agreeable aroma, which is much stronger than that of *americanus* and much like the odor of *subumbratus*. On rocky slopes, exposed to the sun, especially along the edges of the alpine meadows, the typical *sitkaënsis* is replaced by *neoniger* and forms intermediate in size and coloration. At altitudes of 7,000 to 7,500 feet or at higher elevations in very warm, dry situations the var. *americanus* and forms transitional to *neoniger* are not uncommon. At Cloudcroft I failed to find *subumbratus* below 9,000 feet. Its colonies are very populous and live under large stones, usually in the shade of the pines. Its habits, like those of the other subspecies of *umbratus*, are decidedly hypogæic. It does not make carton like the European *umbratus*. This is generally true also of our eastern *aphidicola*. I have, however, found a few colonies of this ant at Colebrook, Conn., and Ottawa, Ontario, nesting in dark brown carton nests in the centers of rotten logs.

The observations proving that the young queens of *subumbratus* establish their colonies with the aid of *sitkaënsis* and *neoniger* workers may now be transcribed from my note-book:

July 3 and 5. Four colonies of *subumbratus* were found under large stones. Two were of considerable size and the superficial chambers of the nests were full of black males and golden yellow females ready for the marriage flight.

July 8. The marriage flight of *subumbratus* must have occurred on July 6 or 7 as there were numerous deälated females running about among the stones on an open, sunny slope where many of the stones covered nests of *neoniger*. My son Ralph assisted me in carefully turning over the stones and examining these nests. In one area, about 200 feet in diameter, nearly every nest had from one to five deälated *subumbratus* queens running about in the large shallow superficial chambers. By shading the chambers, which were occupied by numerous *neoniger* workers and cocoons, the behavior of the yellow queens could be readily studied. They ran in and out of the chambers and galleries leading into the soil and, when accosted by the *neoniger* workers, made peculiar supplicatory movements with the antennæ, precisely like those of *Formica consocians* queens seeking adoption in nests of *F. incerta.* The *neoniger* workers, however, resented the intrusion and frequently seized the legs and antennæ of the queens, though they soon released their hold. The queens thus liberated often escaped from the nest and hid under stones near it or even in unfrequented nooks in the superficial chambers of the nest itself. On several occasions we saw a queen seize a *neoniger* worker, carry it out of the nest and release it uninjured. One queen was seen to snatch up a worker cocoon, carry it out of the nest and conceal it under an adjacent pebble. This is very suggestive of the behavior of the young *Formica sanguinea* queen that has entered a nest of *F. fusca*, but though it undeniably shows an interest on the part of the *subumbratus* queen in the *neoniger* brood, her method of colony formation is not that of *F. sanguinea*, for we soon discovered a depauperate *neoniger* colony which had undoubtedly adopted a *subumbratus* queen. The latter was moving to and fro very slowly and amicably in the midst of several *neoniger* workers and their cocoons in a small recess under a stone. The ants were watched for some time and behaved precisely like members of a single colony. That the queens are nevertheless occasionally treated much more severely by the *neoniger* workers, is apparent from the fact that we found a few recently killed and one partially eaten in the superficial chambers of some of the nests.

July 9. Visited another rocky slope and an adjoining pine forest about a mile east of Cloudcroft and two miles from the locality of yesterday's observations. Under the stones covering *neoniger* and *sitkaënsis* nests there were many deälated *subumbratus* queens eagerly seeking adoption. The following three colonies showed clearly that some of the queens had been or were being accepted:

1. A populous *sitkaënsis* colony under several large contiguous stones among the pines. The superficial galleries of the nest were filled with workers and worker, male and female cocoons nearly

ready to hatch. Under two of the stones a couple of *subumbratus* queens was found, each lurking quietly in a little cavity at the edge of a mass of cocoons nearly filling a large, shallow superficial chamber.

2. A similar but even larger *sitkaënsis* nest, also under a pile of stones, under three of which *subumbratus* queens were found. One of the queens was in a small cavity at the edge of a heap of cocoons while each of the others was resting on the very center of a collection of cocoons nearly as large as my palm. These queens had certainly been adopted and the picture presented was precisely like that of the recently adopted *Formica consocians* queens mounted on the cocoons and surrounded and fondled by the workers of *F. incerta* (Wheeler 1906). When the nest was disturbed the queens hurried into the galleries and disappeared in the soil. They had evidently become strongly negatively heliotactic, unlike queens that are still running about on the soil immediately after the marriage flight.

3. A fine *sitkaënsis* nest under a single large stone among the pines had an adopted *subumbratus* queen surrounded by dozens of workers in the center of a pile of worker and female cocoons nearly as large as my hand. She quickly slipped into a burrow and was only recovered by digging down into the soil to a depth of more than six inches. In this nest a few of the female *sitkaënsis* pupæ were naked, *i. e.*, not enclosed in cocoons.

Further search in the same locality brought to light two mixed colonies consisting of *subumbratus* and *sitkaënsis* workers. I failed to find the queens of the former species, which were probably present but hiding deep in the soil. The failure to find them is not surprising as one very rarely secures the mother queen of a fully developed colony of any of our species of *Lasius* without extensive and very careful excavation of the nest.

The foregoing observations show that the *subumbratus* queen has to acquire the brood odor of the host before she can be accepted. She therefore lurks very near the cocoons in a small earthen cavity and somewhat later, in the early stage of adoption, like *Formica consocians*, takes up a position on the brood. This renders her immune to attack by the host workers and gradually accustoms them to her presence. That adoption can be secured in very populous and flourishing colonies of *sitkaënsis* is shown by the observations of July 9. Nevertheless these observations throw no light on three interesting problems, which may be briefly considered:

1. The first problem relates to the elimination of the host queen, evidently a *conditio sine qua non* of successful colony formation by such temporary social parasites as *subumbratus*. The elimination is supposed to be effected in one of three ways: Either adoption succeeds only in host colonies that have already lost their rightful queen through death by accident or old age, or the queen is killed by her own workers after and because the young parasitic queen has secured their allegiance, or the latter assassinates the host queen. The first hypothesis seems to be supported by the above described adoption of a *subumbratus* queen in a depauperate colony of *neoniger*, although it is by no means certain that this colony was queenless. The large *sitkaënsis* colonies containing recently adopted *subumbratus* queens, however, would seem to support the second or third hypothesis. In regard to this problem in the European *umbratus*, Donisthorpe (1915) says: "No cases are known of the host queen and the parasite living together in a nest, so unless a female can only be adopted by a queenless colony, it must sometimes happen that a female is accepted by a colony already possessing a queen of its own species. In such a case the intruder must either kill the rightful queen herself, as the female of (non-British) *Bothriomyrmex* kills the queen of her host *Tapinoma* or the workers of the host species must themselves assassinate their own queen, as do the workers of *Tetramorium cœspitum* when they have accepted a female *Anergates atratulus*." He adds, however, that "Crawley confined several queens of *umbrata* with queens of *nigra* and the latter were always killed by the former, which although a little the smaller, is stronger and possesses more powerful mandibles." It seems to me that the morphological peculiarities suggested by Donisthorpe, namely the much broader and larger head and stronger mandibles so characteristic of the female of all *umbratus* forms as compared with the same sex of *niger*, indicate very clearly that the parasite actually decapitates the host queen in much the same manner as *Bothriomyrmex decapitans* was seen by Santschi (1906) to decapitate the *Tapinoma erraticum* queen and the queen *Wheeleriella santschii*, the queen of *Monomorium solomonis* (Forel 1906).

2. The fact that one of the *sitkaënsis* colonies observed July 9 contained two fully adopted *subumbratus* queens and one on the verge of adoption suggests the question as to whether all three queens would survive as mothers of the compound colony or whether two of them would be subsequently eliminated. This question can, of course, be answered only by further investigation. But as the various species of the genus *Lasius* hitherto observed are decidedly haplometrotic it seems probable that at least in the majority of cases of adoption of several *subumbratus* queens by a *sitkaënsis* or *neoniger* colony, the number must be subsequently reduced to unity either by combats among the queens or by the regulatory intervention of the workers.

3. My field observations leave some doubt as to whether *sitkaënsis* or *neoniger* is the true, or normal host of *subumbratus*. Indirect evidence, however, points to the former variety, since the queens and workers of *subumbratus* are much more like the corresponding phases of *sitkaënsis* in size and coloration and since pure adult colonies of these forms prefer the same shady environment and have the same hypogæic habits. Reiff's Nova Scotia specimens of *subumbratus* queens from *sitkaënsis* nests may also be cited in this connection. *L. neoniger*, therefore, would be an unusual or perhaps recently acquired host, and the conditions would be comparable to those of the typical European *umbratus*, whose normal host is the typical *niger*, though it is occasionally parasitic, as Donisthorpe has shown (1915), on the subspecies *alienus*, the normal host of *mixtus*.

The rather large number of observed cases of adoption of *subumbratus* seems to indicate that the queen of this subspecies is specially favored as compared with the queens of some other temporary social parasites (*e. g. Formica rufa* and *truncicola*) by the possession of peculiar myrmecophilous characters (trichomes, exudate organs). I believe that the beautiful golden yellow color and pilosity of the *subumbratus* queen, which make it resemble the queens of *Formica consocians*, *ciliata*, *criniventris* and *oreas*, the smaller stature and the delicate odor may be designated as such characters. In this connection I may call attention to the queen of *Lasius crinitus*, long ago described by Frederick Smith from Cashmir, as being in all probability a temporary social parasite on *L. niger* or one of its varieties. I have recently seen a few queens of *crinitus* from Sikkim and was struck by their remarkable resemblance in color and pilosity to the queens of the Colorado *F. ciliata*. The source of the delicate odor of *subumbratus*, of the strong, lemon-verbena odor of our North American *Lasii* of the subgenus *Acanthomyops* and of the peculiar pungent, sweetish odor of the Eurasian *fuliginosus*, is worthy of further investigation. Meinert and Bönner believe that in *umbratus* and *fuliginosus* it comes from the salivary glands. Forel had previously traced it to the head as this portion of the body when crushed emitted a more violent aroma than the thorax and gaster. I have been under the impression that it might originate in the epinotal glands. Since it is so powerful and pervasive that it even saturates the walls of the nest a renewed and careful investigation may be required before its precise source in the body of the insect is known.

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NOTES ON THE MARRIAGE FLIGHTS OF SOME SONORAN ANTS.

By William Morton Wheeler.

Myrmecological literature contains many accounts of the marriage-flight of ants, but in nearly all cases the descriptions are fragmentary, owing to the complexity of the phenomena, the great area over which they occur and the obstacles, such as forests, hills or buildings which in most localities interfere more or less with observation. Moreover, the actual mating of the males and females often takes place high in the air or even at night, so that one is apprised of the occurrence of a flight only by finding the recently fecundated and deälated queens running about on the ground. The following observations made during the past summer near Cloudcroft, N. M., and later while I was accompanying the Cornell Biological Expedition across the deserts of southern Arizona, are in some respects as incomplete as others which have been published, but since they illustrate interesting peculiarities in the behavior of a few of the more conspicuous ants of the Sonoran region, it seems advisable to record them.

1. *Liometopum apiculatum* Mayr.

This ant, which has huge females and males, out of all proportion to the small workers, is peculiar to the live-oak zone, or "encinal" of the dry mountains of Texas, New Mexico, Arizona and Colorado and therefore does not live at altitudes above 6,000–7,000 feet. At the latter altitude near Wooten, in the Sacramento Mountains of New Mexico, I found it to be very scarce. Undoubtedly it is abundant at lower elevations in the same range. During the marriage flight, however, the males and females are carried by air-currents to considerably greater altitudes. July 3, while walking down Haine's Canyon, a few miles from Cloudcroft, I saw numerous males of *apiculatum*, which had fallen on the road at altitudes between 8,000 and 8,500 feet. As some of them were still alive the marriage flight of the species must have occurred on this or the preceding day. They were being rapidly dragged away as food by foraging *Formica fusca* workers. July 5, near Russia, at an altitude of 9,400 feet, I detected four deälated *apiculatum* queens, each in a small cavity under a stone. All of them were dead and more or less decomposed, showing that they had been wafted to this altitude the previous summer and had perished, probably from cold, while endeavoring to found colonies. These observations strengthen Forel's and my contention that in mountainous regions queen ants are often borne up by air-currents to elevations at which the physical conditions will not permit them to establish the species. It is very probable that this process continues year after year and that it may constitute an appreciable drain on certain ant-populations at lower altitudes.

2. *Pogonomyrmex barbatus* F. Sm. subsp. *rugosus* Emery.

July 29 we visited the ancient ruins of Casa Grande, nine miles south of Florence, Ariz. In the rooms on the ground-floor of the three-storied portion of the structure still standing we found vast numbers of males and females of *Pogonomyrmex barbatus rugosus*, only a small portion of which were still living. The marriage flight of these large ants must have occurred a day or two previously, and the swarms, for some reason, had entered the low, narrow doorways of the ruin and accumulated on the floor in such masses that several bushels could have been collected.

3. *Pogonomyrmex barbatus* F. Smith subsp. *molefaciens* Buckley.

At Tempe, Ariz., the marriage flight of this ant took place at 5 p. m., July 31, nearly a month later than the flights I observed many years ago in Central Texas. Thousands of males and females issued from the large, flat nests in the irrigated fields about the town and soon disappeared in the cloudless sky. On the following day, August 1, the fecundated females were seen in great numbers digging their craters in the soil. They preferred the damp margins of the puddles left by recent rains and the banks of the irrigating ditches. So numerous were the little craters that their peripheries were often in contact. The females were busily bringing up the moist earth in their psammophores as pellets one-eighth of an inch in diameter and depositing them near the orifice of the eccentric burrow.

4. *Pogonomyrmex* (*Ephebomyrmex*) *imberbiculus* Wheeler.

Near Deming, N. M., I witnessed the marriage flight of this ant at 10 a. m., July 12. The black males were flying rapidly to and fro about the branches of a few small lote bushes (*Zizyphus lycioides*) in the open desert, in precisely the same manner as I have seen the males of *Prenolepis imparis* dancing about the Japanese barberry bushes in April in the Arnold Arboretum, near Boston. The winged females of *imberbiculus* were far from numerous and were found running on the ground near the lote bushes. Mating was not observed.

5. *Atta* (*Moellerius*) *versicolor* Pergande.

The marriage flight of this fungus-growing ant is very different from that of any ant I have observed, and was witnessed under unusually favorable conditions. We had left our camp July 30 about 30 miles north of Florence, Ariz., and were crossing the desert on our way to Phoenix. The air was very still and clear after a heavy rain on the preceding day. At 5.50 a. m., just after sunrise, we entered a region several miles in extent where the marriage flight of *Atta versicolor* was in full swing. The ants were aggregated in numerous sharply defined swarms, each of which was egg-shaped or elliptical, about six to ten feet long and three to four feet broad, stationary some twenty to thirty feet above and with its long axis perpendicular to the surface of the earth. In some places the swarms were only about forty or fifty feet apart but more frequently the distance between them was fully a hundred feet or as many yards. As far as the eye could see over the desert similar swarms could be discerned. Within each swarm the large dark brown males and females were darting about in vertiginous, zigzag flight. Closer examination showed that each swarm was constantly receiving single males and females flying straight to it from a distance, but it did not grow in size because pairs of ants *in copula* were constantly raining down to the ground from its lower extremity, so that under each swarm there was a dense layer, often a yard or more in diameter, of writhing and struggling ants. One of the swarms happened to be poised above a puddle of water so that the surface of the latter became black with the fallen pairs. We rode for fully half an hour through these swarms, which must have comprised hundreds of thousands of ants. The activity of the insects was truly surprising, for the workers of *versicolor* are sedate and slow-moving like all other Attii. The whole phenomenon was rendered remarkably clear and striking by the large size and dark color of the ants and their wings, the stillness and purity of the air and the unobstructed view over the level desert. Unfortunately our haste to reach Phoenix before night and the prospect of a very muddy road ahead, made it impossible to stop and observe the conclusion of the flight and the subsequent behavior of the *versicolor* queens. On previous visits to Arizona I had found the species in the neighborhood of Benson, Tucson and Yucca. The past summer I took it also near Oracle in the Santa Catalina Mountains, near Casa Grande and a few miles from Texas Pass on the western slopes of the Dragoon Mountains. In all these localities the colonies are sporadic and by no means abundant so that it is difficult to account for the vast number of males and females engaged in the flight described above, unless we assume that they represented the entire annual sexual output of a large number of colonies distributed over a very extensive territory.

THE PLEOMETROSIS OF MYRMECOCYSTUS.

By William Morton Wheeler.

It has long been known that the colonies of some species of ants never possess more than a single fertile queen, whereas in other species several such queens are normally present. Wasmann has recently named the former condition "haplometrosis," the latter "pleometrosis."[1] Among North American ants the species of *Camponotus*, *Polyergus*, *Pogonomyrmex*, *Aphænogaster* and *Lasius* are normally haplometrotic, whereas the species of *Formica*, *Tapinoma*, *Crematogaster*, *Pheidole*, *Monomorium* and *Myrmica* are pleometrotic. This condition undoubtedly arises in most colonies secondarily from a primitive haplometrosis through the deälation and adoption of one or more daughter queens. Large colonies of *Formica obscuriventris*, *e. g.*, often contain a number of daughter queens in various stages of deälation. The number of queens thus accumulated in some colonies is considerable. I have counted more than thirty in a single medium-sized colony of the typical *F. fusca*, and a single mound of *F. exsectoides* may contain nearly or quite as many. Occasionally, however, the pleometrosis is primary. In other words, two or more queens may establish a colony together. Forel, Bönner and I have found cases in which two queens of the European *Lasius flavus* were starting a colony in the same small cavity under a stone. Donisthorpe has seen three and Crawley and Wasmann four queens of this species in similar association. On two or three occasions I have also seen twin queens of our North American *L. brevicornis* with young brood under a stone. In some of these cases the colony undoubtedly becomes secondarily haplometrotic by one queen killing the other or by the colony splitting into two, each with its own queen. According to von Buttel-Reepen, Mrázek and Crawley, this seems to be regularly the case with *L. niger*, when two or more queens are constrained to found a colony together in an artificial nest.

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[1] These terms are equivalent to "monogyny" and "polygyny" employed by students of the social wasps, though somewhat more expressive as they call attention to the maternal or nursing activities.

The following observation, made during the past summer while I was with the Cornell Biological Expedition, throws some additional light on primary pleometrosis. On July 29 the heaviest rain in six years fell in Phoenix, Ariz., and temporarily inundated parts of the desert south of that city in the neighborhood of Higley. On July 30 we left our camp about 30 miles north of Florence and proceeded along the road to Phoenix over soil which had been drenched by this rain, with the result that our three motor cars were repeatedly stuck in the mud. . While the younger and lustier members of the party were extricating our cars and two others which had been stalled all night in deep puddles, I took advantage of the delay to study the ants along the roadside. Many colonies of various species, whose nests had been inundated, were moving to drier ground. My attention was especially attracted by dozens of incipient nests of *Myrmecocystus melliger* Forel subsp. *mimicus* Wheeler. The large reddish queens had evidently celebrated their nuptial flight immediately after the storm and were now busily digging into the wet adobe soil, making small craters about two inches in diameter with eccentric opening. The wall of the craters consisted of small pellets about one-eighth of an inch in diameter, evidently carried up in the psammophore, or crate of peculiar stiff hairs with which the gular surface of the head is furnished in these ants. On seizing a queen just as she was carrying out and dropping her pellet on the wall of the crater I was surprised to see another queen leave the entrance with a similar burden. This led me to examine some twenty nests—all, in fact, that I had time to excavate before I was obliged to proceed with the party. My rather hurried observations showed that about half of the craters had been established by single queens but that the others were each the work of two coöperating queens. One crater actually contained five queens, four deälated and one with intact wings! It appears, therefore, that about 50 per cent. of the colonies of *mimicus* are pleometrotic in origin. That they probably remain so is indicated by the fact that on former excursions in Arizona I have on several occasions taken more than one deälated queen from a single adult colony of this ant.

The foregoing observation is of interest to the myrmecologist, because the *mimicus* queens were actively coöperating in the construction of a single nest as if they had been so many workers, whereas in the rare cases of *Lasius flavus* and *brevicornis* above cited the consociation of two queens may be interpreted as due to an accidental meeting under the same stone just after the marriage flight. Of course, it is very probable that in all the cases the queens in the same nest were sisters that had met after fecundation, since queens from different maternal nests would hardly work together so harmoniously. Nevertheless, the very high percentage of cases of primary pleometrosis in *mimicus* points to the existence in this ant of a pronounced tendency for recently fecundated sisters to assemble in pairs or even greater numbers for the purpose of founding and developing a colony in common.

THE DISTRIBUTION OF THE NOSE FLY AND OTHER SPECIES OF GASTROPHILUS IN THE UNITED STATES.[1]

By F. C. Bishopp,

Bureau of Entomology, Dallas, Texas.

The distribution of the species of bot flies in the United States is a question which has been much neglected. Each is of considerable importance to stock raisers and farmers in this country and it seems strange that more facts regarding their introduction, spread and local and seasonal abundance have not been recorded.

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[1] Published by permission of the Chief of the Bureau of Entomology.

The common horse bot or nit fly, *Gastrophilus intestinalis* De Geer, on account of its abundance and comparatively slow flight, has been most readily observed and most frequently mentioned in literature. It was undoubtedly introduced into this country many years ago and has become widely spread throughout the United States. We have records of its occurrence in nearly all parts of the country though it seems to vary much in local abundance. At high elevations it seems to be rare.

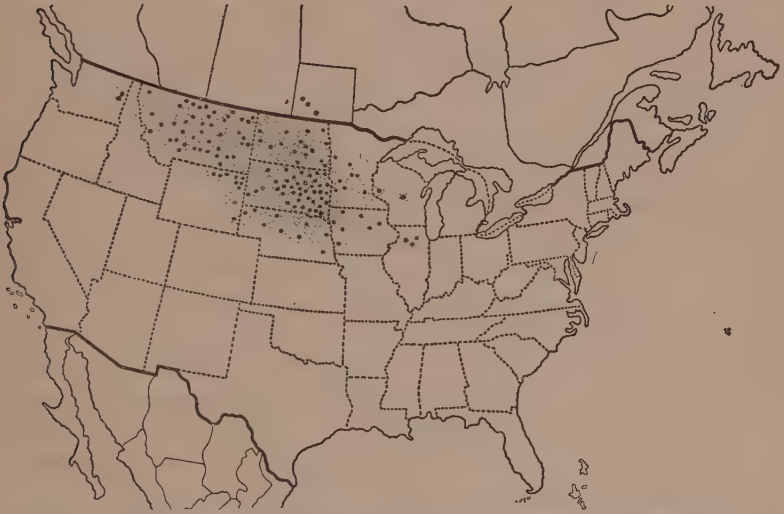

Fig. 1. Map showing the distribution of the nose fly, *Gastrophilus hæmorrhoidalis* L. in the United States. The large dots indicate localities where this insect has been reported and the small dots its probable distribution.

The chin fly, *G. nasalis* L., also appears to be well distributed over the United States. We have rather clear records of its occurrence in practically all states from Texas to North Dakota and from New York to California; also in the western part of Canada. It occurs, no doubt, in the eastern part of Canada, and in the eastern states of the Union.

The nose fly, *G. hæmorrhoidalis* L., is undoubtedly the most important economic species of the three when it is present in abundance, due to the worriment caused by the adult during the period of oviposition.

The distribution of the nose fly was less known than the others until the work of the Bureau of Entomology on this pest was taken up three years ago. The common name which is generally used over the territory where it abounds and the scientific name of one of the other species (*G. nasalis*) has led to some confusion. It may be said that neither of these names are very appropriate as the eggs of *G. hæmorrhoidalis* are laid on the lips and those of *G. nasalis* under the jaws. The last named species has received the vernacular names of "chin fly" or "throat bot fly." The employment of the common name "nose fly" for the former species seems to be justified by usage among farmers and the name "throat bot fly" is preferred for the latter on account of the egg-laying habits of the female and the habit of the larvæ of this species of attaching occasionally at least in the œsophagus.

The early history of the occurrence of this species in the United States seems to be clouded. Lugger, in his second Minnesota Report (p. 242), records it positively from that state. The actual specimen upon which the statement is based is not in existence, however, according to Prof. C. W. Howard. Some seem to have accredited the species to Kentucky, based on Professor Garman's statements in the Kentucky Experiment Station Report of 1894, but he does not record the species from that state, and informs me he has never seen the fly there.

During the summer of 1914 the writer made preliminary inquiry into the distribution, history of spread, and the injuriousness of the nose fly in the north-central states, where it had been reported to the Bureau as a serious pest of horses. At that time the insect appeared to exist throughout the greater part of North and South Dakota, eastern Montana, and possibly to occur in limited numbers in western Minnesota. No effort was made to determine the exact limits of distribution. It is evident, however, that the species has been spreading southward and eastward, as shown by statements of numerous farmers more recently interrogated in different sections. While there is some disparity the statements agreed remarkably well as to the time of first appearance in a given community. In 1914 it appeared that the fly had become established south of the center of South Dakota only within the preceding four or five years. In working northward and westward the dates set by farmers as the time of first appearance became earlier until Minot, N. D., was reached where a rather authoritative record was secured of the occurrence of the fly eighteen years before (1896).

During the spring of 1915 and 1916 Mr. W. E. Dove and the writer made further inquiry into the distribution of this insect in parts of South Dakota and Minnesota, and Mr. Dove was located in this region and made further inquiry regarding the history of the spread of the insect during the summers of 1915 and 1916. His work largely substantiated the earlier findings.

To supplement personal observations and questioning, a large number of letters of inquiry were sent to farmers and horse breeders in the region from Indiana to Washington, and Kansas to Canada. About 350 replies were received. One correspondent each in Colorado, Idaho, Utah and Oregon, and three in Washington replied that the nose fly is present, but there is reason to believe they were mistaken in the identity of the insect, except possibly two in eastern Washington.[1] All reports from Indiana, Kansas and Missouri were negative. Three affirmative ones were received from Illinois and two from Wisconsin.[1] While neither was corroborated with specimens it is practically certain that infestations, possibly more or less local, occur in these states. Montana and North and South Dakota are generally infested at this time and central western Minnesota, northern Nebraska and northeast Wyoming undoubtedly so. It appears from replies and personal examinations that the insect is more or less scattered over Iowa, but probably not numerous except in the northwest part.

In Canada we have learned through correspondents of the presence of the nose fly in southern Manitoba and Saskatchewan.

A very interesting discussion regarding the occurrence of the nose fly in Canada appeared in the Proceedings of the Entomological Society of Ontario for 1915. Professor Lochhead there presents extracts from some correspondence from men in western Canada. It is my opinion that these correspondents, except one from Ontario, refer especially to *G. hæmorrhoidalis* although one sent in specimens of *G. nasalis*, which is much more easily caught.

[1] Since this article was submitted for publication the localities in Wisconsin and Washington have been visited. The nose fly is well established in western Wisconsin but its presence in central Wisconsin and eastern Washington could not be verified.

This apparently led to some confusion as to the species concerned and the use of the term "nose fly" led to further confusion. It should be remembered that this vernacular name is applied with few exceptions to *G. hæmorrhoidalis* by horse breeders and farmers. These men write of the presence of the insect in Alberta as well as Manitoba and Saskatchewan, and it probably occurs still farther west.

The dates of first appearance in the different sections as reported by correspondents agree quite well with what has been found by inquiry by Mr. Dove and the writer. The earliest date given was 1883, by a correspondent in western North Dakota, and a correspondent in central Montana (Fergus County) states that they were there in 1898, and another slightly farther west in Montana gives 1890 as the date of appearance. Wyoming and Minnesota seem to have been invaded during the last seven years, Nebraska within the past six years, Iowa about five years ago, and the other states more recently.

Just why *G. hæmorrhoidalis* did not come into prominence as a pest of horses years ago it is difficult to tell. It seems almost certain that the species was brought into this country at an early date with shipments of horses from Europe. Failure to establish itself may have been due to conditions surrounding the imported animals after arrival here; such as adverse climatic conditions. It is possible that climate may have a marked influence on the perpetuation of the species in any region and that it will not thrive in the more humid area east of the present area of great abundance in the Dakotas. It is also barely possible that the species may have been present in parts of this country years ago and then became extinct or nearly so, but this is hardly plausible. Certainly our investigations indicate a comparatively recent establishment of the insect in the United States, and that the point of first establishment was in western North Dakota or eastern Montana, or possibly in southern Saskatchewan.

The habits of the insect indicate that its dissemination is largely brought about by the movement of horses. The long time which the larvæ spend within the host and the rather extended period during which they normally leave the animal add to the danger of spread by shipping or driving horses from infested to uninfested territory. The great number of horses recently shipped from infested regions to concentrating points from which they were transshipped to Europe for military purposes may have resulted in the establishment of other foci of infestation not now known. Increased activity at this time in the shipment of horses from the infested territory for use in our own cavalry and for agricultural purposes will no doubt give every opportunity for the insect to become widely established if some natural agencies do not prevent or steps are not taken to destroy the bots before horses are shipped.

The accompanying map shows the probable present distribution of the species in the United States, and indicates the points where its presence has been observed by us or recorded by correspondents. The comparatively small number of large dots in North Dakota is explained by fewer circulars being sent there rather than by a smaller number of nose flies.

PRELIMINARY EXPERIMENTS WITH SODIUM FLUORIDE AND OTHER INSECTICIDES AGAINST BITING AND SUCKING LICE.

By F. C. Bishopp and H. P. Wood,

Bureau of Entomology, U. S. Department of Agriculture.

The very satisfactory results secured by the authors with the use of sodium fluoride against various species of biting lice (Mallophaga) on chickens and other domestic fowls[1] naturally has led to inquiry from many sources as to the effect of this compound on lice of cattle, horses, and other domestic animals. So it is thought advisable at this time to publish a few preliminary notes on the results of the use of this material and other insecticides against several species of Mallophaga and sucking lice on such hosts. A few experiments carried out during 1910 and 1912 indicated that the standard arsenical dip usually known as the B. A. I. formula (8 lbs. white arsenic, 24 lbs. sal soda, 1 gal. pine tar, to 500 gals. water) is a very effective insecticide against both the Mallophaga and Anoplura. In these tests it was found that one thorough spraying or dipping of cattle quite heavily infested with biting lice (*Trichodectes scalaris* Nitzsch), and the short-nosed ox louse (*Hæmatopinus eurysternus* Nitzsch) completely destroyed them in two treatments at weekly intervals. It was not ascertained, however, if one application would be sufficient.

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[1] See Farmers' Bulletin No. 801.

More recent work included tests of a considerable number of insecticides. The results of the early tests with arsenical solution were completely borne out and it appeared that all forms of both the biting louse (*T. scalaris*) and the long-nosed ox louse (*Linognathus vituli* L.) were destroyed with one dipping. In one experiment with arsenical solution of one-half the normal strength both adults, larvæ, and eggs of *T. scalaris* were destroyed. The use of this strength against the long-nosed ox louse did not accomplish complete destruction. The action of the arsenical solution against the biting lice was quite prompt, but the sucking lice were killed more slowly, as in the case of ticks.

All of our tests prove that the biting lice are quite susceptible to the action of caustic or poisonous substances. They seem to be killed uniformly more easily and quickly than the sucking species. In a series of experiments against the biting lice of cattle the following substances were used in addition to arsenical dip: Kerosene emulsion (2 gals. kerosene, ½ lb. laundry soap, 1 gal. water, reduced 1 to 8 and 1 to 12); flowers of sulphur (½ lb. per animal); 40 per cent. nicotine sulphate (1 to 800); soap and water (1 oz. per gal.); sodium fluoride (commercial, 90 to 98 per cent.) as dust and dip. All of these substances, with the exception of the soap and water, killed all stages. The soap and water destroyed everything but the eggs, which hatched successfully.

The sodium fluoride (97 to 98 per cent.) was used as a spray at the rate of one ounce and also one-half ounce per gallon. In both of these strengths all stages were promptly destroyed. When applied as a dust the material was put on with flour in the proportion of one ounce to five ounces of flour, six ounces of this mixture being used on a yearling. Three ounces of sodium fluoride were applied to an animal with a shaker and the material worked into the hair, and in another test one ounce was applied with a bellows dust gun. In each of these tests the destruction was complete.

A number of experiments were also conducted with the use of sodium fluoride against the biting dog louse (*Trichodectes latus* Nitzsch). Some of the animals treated were very heavily infested and covered with sores evidently caused by the presence of the lice. In some tests the material was applied by hand with a dust can, about one ounce being used to each animal, and in others it was applied as a dip, the sodium fluoride being dissolved in water at the rate of one ounce to the gallon. In all of these tests the destruction was complete and the lesions promptly healed.

Experiments conducted thus far with sodium fluoride clearly show its efficacy in the case of Mallophaga on domestic animals. Owing to the comparatively high price of the substance (about 50 cents per pound) it is inadvisable to recommend its use in the form of a dip for large animals as other equally effective dips which are much cheaper may be used. The tests indicate, however, that the substance may be very useful for the winter treatment of animals, especially in the northern states where dipping during the cold weather is impractical. Attention also should be called to the fact that infestations are normally heaviest during the winter and spring months, just at a time when the practice of dipping might be dangerous. The application of sodium fluoride with a dust gun is not laborious, and since it appears that only about one ounce of material per animal is necessary the treatment would not be expensive. Our preliminary tests also indicate that if all animals in a herd are treated at one time in this way, one application will be sufficient. Although we have found that lice may live from 7 to 15 days when removed from the host it appears that under usual circumstances sodium fluoride is retained in the hair for sufficient length of time to destroy any lice which may happen to return to the host.

While there appears to be some possibilities in the use of sodium fluoride against sucking lice the experiments thus far conducted indicate that it can not be relied upon for use against any of the members of this order.

GEOMETRID NOTES.

By L. W. Swett,
Boston, Mass.

I am convinced, after a careful study of the genitalia, that the American form of Eucymatoge, now listed as *Horisme vitalbata*, D. & S., is distinct from the European. I have received a number of specimens, of the American form of *vitalbata* through Mr. Wolley Dod from Calgary, Alberta, and of the European through Dr. Bastelberger and I can find only very slight external differences. The American form of *vitalbata* seems to have the yellow band of primaries, more of a grayish cast, where the European is a deep yellow. Also the band of the primaries seems narrower than the European and at the apex is more clouded. It is very hard to draw any definite characters for separating them except on the genitalia which prove most distinct and so would list the American form as a race, if not later may turn out to be a good species.

Horisme vitalbata D. & S. var. **incana** nov.

The valvæ are narrower and longer than the European *vitalbata* and the sacculus is most distinct, being bifurcate at tip. It resembles slightly the shape of a boy's mitten, with the thumb projecting at an angle. In the European *vitalbata* this process is rounded with but a single jointed projection. Also the penis of the American form is thicker than the European and the œdeagus is spined in the middle, which is lacking in *vitalbata*. The tip of the penis is bulbous with short spines apparently knobbed at the base, and the vesica has wide and long cornuti. The saccus is broad and rounded. The ductus bursa of the female genitalia has three elongated patches from which long stout spines protrude. At the junction of the neck or ductus bursa and the bag or bursa there is a row of very stout spines projecting at all angles. The bursa is instrate or covered with fine spines not heavy and thick as in *vitalbata*. The edge of the bursa in *vitalbata* is surrounded with heavy spines, where in *incana* they are not any thicker than in the other sections. The true *vitalbata* D. & S. may possibly occur in North America as our material at present is so limited, so I have listed the American form as a race until we know more about the life-histories. It is evident from my study of the genitalia that we need large series of specimens, field notes and life-histories before we can list forms, races or species on our present scanty knowledge, as at present it is more or less individual opinion. I have made the male, from which I prepared my best slide, as the type, in case the true *vitalbata* D. & S. should occur in North America.

Expanse 27–29 mm.

Holotype ♂ — VI — 5, 1914, Calgary, Alberta, from Mr. Wolley Dod.

Allotype ♀ — VI — 26, 1907, Calgary, Alberta, from Mr. Wolley Dod.

Paratype ♀ — VI — 26, 1914, Calgary, Alberta, from Mr. Wolley Dod.

All the above are in my collection.

NOTE ON THE ICHNEUMONID GENERA CYANOCRYPTUS AND LAMPROCRYPTUS.

By Charles T. Brues.

When collecting insects in the Peruvian Andes several years ago, I secured a large metallic blue Ichneumonid which proves to be the female of *Cyanocryptus metallicus*, a species described by Cameron in 1903 from a male specimen collected in Ecuador. Since then I have received through Dr. F. E. Lutz of the American Museum of Natural History a quite similar insect from Southern Patagonia apparently referable to Cameron's genus Lamprocryptus, which can hardly be separated from Cyanocryptus.

Since the female of *Cyanocryptus metallicus* has not been described and as there is some confusion concerning the name Lamprocryptus, the following note is presented.

Cyanocryptus Cameron.

The Entomologist, Vol. 36, p. 121 (1903).
Schmiedeknecht, Opus. Ichneum., fasc. VI, p. 415 (1904).
Schmiedeknecht, Gen. Insect., fasc. 75, p. 13 (1909).

Type: *C. metallicus* Cameron.

Cyanocryptus metallicus Cameron

The Entomologist, Vol. 36, p. 121 (1903) (♂).

Female. Length 19 mm., ovipositor 10 mm. Brilliant metallic blue; head and thorax with purplish reflections, especially on the cheeks and propodeum; first two segments of abdomen strongly purplish; remaining ones bluish; antennæ black with a white annulus from the middle of the second flagellar joint to the tip of the ninth, the second and basal half of the third black above. Tarsi, palpi, mandibles, and ovipositor with its sheaths black; four anterior tibiæ dark brown, with but little metallic color. Wings black, with brilliant blue and purple reflections. Antennæ slender, tapering; first flagellar joint four times as long as thick; second and third but little shorter; fourth half as long as the first, fifth and sixth each slightly shorter. Propodeum coarsely reticulated, with well developed, but not large lateral teeth; without complete transverse carinæ, but with the anterior one indicated medially as a short curved ridge bent forward at the middle where it is contiguous to a very small basal area. Abdomen shining, microscopically roughened and punctulate but not sufficiently so to render its surface opaque. Transverse median vein almost interstitial with the basal vein, the submedian cell barely longer.

Aside from the position of the transverse median vein which Cameron describes as "not interstitial" and the abdomen which is "shining, impunctate" in the male there are no conspicuous differences between the sexes. The female I took near Matucana, Peru at an altitude of 7,500 feet. The male type from Ecuador was taken at between 7,000 and 8,000 feet altitude. This insect is evidently common in the Peruvian Andes as I saw numerous specimens in Professor Townsend's collection taken by him in the same part of Peru.

LAMPROCRYPTUS SCHMIEDEKNECHT.

Opusc. Ichneum., fasc. VI, p. 414 (1904) (no species).

Schmiedeknecht, Gen. Insect. fasc. 75, p. 11, pl. 1, fig. 7, pl. II, fig. 5 (1908) (six species described).

Viereck, Bull. U. S. Nat. Mus., No. 83, p. 81 (type species designated).

Type: *L. gracilis* Schmiedeknecht.

LAMPROCRYPTUS CAMERON.

Trans. Amer. Ent. Soc., Vol. 35, p. 435 (1909).

Type: *L. kinbergi* Holmgren.

Schmiedeknecht first used the name in 1904 in his Opuscula Ichneumonologica without designating any type. In the Genera Insectorum (1909) he again lists "Lamprocryptus nov. gen." and describes six species, one of which has been designated as the genotype by Viereck who dates the genus from 1904.

Cameron used the name in December 1909 and refers to the generic key in Schmiedeknecht's 1904 paper, but through a peculiar *lapsus* attaches the name Lamprocryptus to his new genus. As Cameron's genus hardly seems distinct from Cyanocryptus it appears unnecessary at the present time to propose a new name.

Several South American species, including the new one described below, may be tentatively placed in Cyanocryptus, as follows.

C. metallicus Cameron (type). Entomologist, Vol. 36, p. 122 (1903). Ecudoris Peru.

C. kinbergi Holmgren (type of Lamprocryptus Cameron). Eugenias Resa, Ins., p. 397 (1868) Argentina.

C. chalybeus Tasch. Zeits. f. d. ges. Naturw., Vol. 48, p. 63 (1876) Argentina.

C. sericeus Tasch. *Ibid. l. c.* Argentina.

C. fulgidus sp. nov. South Patagonia.

Cyanocryptus fulgidus sp. nov.

Female. Length 11 mm., ovipositor 6 mm. Brilliant metallic blue with violaceous reflections, the latter most noticeable on the head, upper surface of thorax and on the first three segments of abdomen; antennæ black, without annulus; hind femora and tibiæ bright ferruginous; front femora beneath and their tibiæ entirely ferruginous; middle tibiæ dull ferruginous; all tarsi black, the trochanters and the four anterior femora with the metallic reflections much less pronounced than on the body. Wings deeply infuscated, but not black. Head seen from above strongly emarginate both on the front and the occiput, the paired ocelli widely separated, farther from one another than from the eye margin. Face strongly convex medially, with a sharp depression on each side next to the eye below the insertion of the antenna, face rather finely and closely striato-punctate medially, more sparsely and coarsely punctate laterally; clypeus strongly convex, with a few large punctures; front reticulate medially to the ocelli, on the sides smooth and almost impunctate as are also the back of head and cheeks. Malar space one-third as long as the eye, not grooved, but with finely sculptured band from the eye to the mandible. Antennæ 50-jointed, slender and tapering, not distinctly thickened medially; first, second and third flagellar joints gradually shorter, the third three times as long as thick and as long as the two following together; following all distinctly wider than long. Mesonotum polished, with a few scattered punctures on the anterior half, those on the median lobe closer together and elongated to form a semi-striate sculpture; parapsidal furrows strong on anterior half, entirely absent behind. Scutellum strongly convex, with a deep impression at base that is bounded by high lateral carinæ and bears a series of square foveæ at its bottom. Propodeum coarsely irregularly rugose-reticulate, with large flattened teeth at the posterior angles; anterior transverse carina very weak, but complete; posterior slope deeply concave, the concavity extending above the lateral spines; viewed from the side the declivity is almost as long as the dorsal surface and nearly perpendicular. Propleuræ almost smooth at top, elsewhere coarsely more or less horizontally wrinkled; mesopleura with a shining callosity at its upper posterior angle and a series of oblique wrinkles along the posterior edge, elsewhere irregularly rugose-reticulate, as are also the metapleuræ and sides of the propodeum. Abdomen entirely smooth, impunctate and without trace of aciculations or other fine sculpture. Petiole sharply bent, strongly expanded at tip, with a complete carina passing through the spiracles and a large crescentic impression above each spiracle. Second segment with a curved impressed line on each side below the spiracle and a less distinct one passing through the spiracle. Tarsi and middle tibiæ strongly spinulose. Areolet large, its sides weakly convergent above; radial cell short and narrow; submedian cell barely shorter than the median; discocubital vein simple; cubital vein entirely wanting beyond the areolet, transverse median vein in hind wing broken near lower third.

Type: South Patagonia, B. Brown; in the American Museum of Natural History.

The following key will serve to separate the species of this group:

1. Antennæ annulate with white............................2
   Antennæ not annulate....................*fulgidus* sp. nov.
2. Legs entirely black........................*metallicus* Cam.
   Legs partly ferruginous or rufous.........................3
3. Abdomen minutely transversely aciculate..................4
   Abdomen polished, without any sculpture..*chalybeus* Tasch.
4. "Thorax rugulose-granulate, mesonotum and scutellum smoother"..............................*kinbergi* Holm.
   "Mesonotum densely, somewhat longitudinally, striate punctate"..................................*sericeus* Tasch.

NOTE ON THE ADULT HABITS OF SOME HYMENOPTEROUS EGG-PARASITES OF ORTHOPTERA AND MANTOIDEA.

By Charles T. Brues,

Bussey Institution, Harvard University.

In a recent number of the *Bulletin de la Société Entomologique de France*[1] Dr. Ét. Rabaud has called attention to an omission in a recent paper of my own,[2] in which I failed to cite some observations of similar nature by French naturalists. In this paper I described an Indian Scelionid which attaches itself to the body of a locust and suggested that it probably had adopted this method of finding the eggs of locusts, upon which members of allied genera are known to be parasitic.

As Dr. Rabaud has assumed a rather critical attitude, I think it worth while to review the matter briefly. In the first place I must admit that I was unfamiliar with the observations of Xambeu at the time of writing my previous note, although they were soon afterward called to my attention by Mr. Nathan Banks who cited them some years ago.[3] In the same paper, Banks gives another reference[1] that was missed by both Dr. Rabaud and myself, in which a locust (*Dichromorpha viridis*) was found by W. V. Warner bearing adults of a species of Scelio.

---

[1] 1917, No. 10, p. 178, May 1917.

[2] Adult Hymenopterous Parasites Attached to the Body of their Host. Proc. Nat. Acad. Sci., Vol. 3, pp. 136–140, Feb. 1917.

[3] Entom. News, Vol. 22, p. 195, 1911.

Rabaud unfortunately refers to the Lepidoscelio which I described (*loc. cit.*) as a Chalcidid. It is a member of the Scelionidæ, belonging to the Serphoidea (*Proctotrypoidea*), an entirely different group of Hymenoptera, although the work of Xambeu, Giard, and Bordage is correctly stated as relating to Chalcidids. This phenomenon of phoresy thus appears in members of both the Chalcidoidea and Serphoidea. Rabaud is also wrong in thinking that I put forth as new either the fact that adult Scelionids attach themselves to Orthoptera, or the hypothesis that they locate the eggs of the host in this way. On page 137 of my paper I have quoted both the fact and the hypothesis as previously published by Ashmead in 1893: the text is absolutely clear on this point.

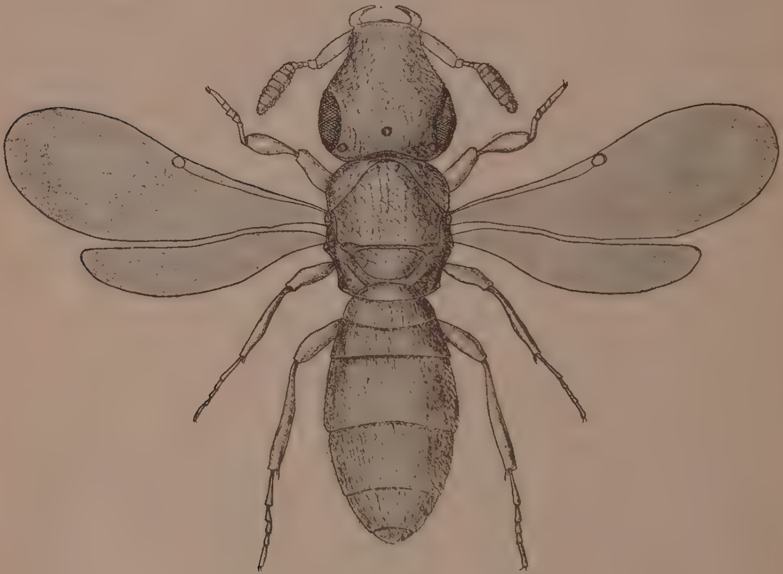

Fig. 1. *Lepidoscelio viatrix* Brues.

As the tiny species which has caused so much discussion has not before been figured I take this opportunity to add a drawing of it kindly made by Mrs. Brues.

---

[1] Proc. Ent. Soc. Washington, Vol. 5, pp. 308-309.

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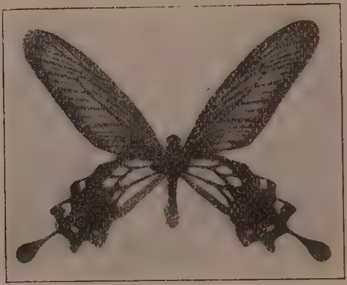

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INDEX TO VOL. XXIV. 1917.

INDEX TO AUTHORS.

Banks, N. Notes on Some New Species of the Genus Dioctria (Asilidæ), 117.

Barber, H. G. Synoptic Keys to the Lygæidæ (Hemiptera) of the United States, 128.

Bishopp, F. C. The Distribution of the Nose-fly and Other Species of Gastrophilus in the United States, 182.

Bishopp, F. C., and H. P. Wood. Preliminary Experiments with Sodium Flouride and Other Insecticides against Biting and Sucking Lice, 187.

Brues, C. T. Note on the Adult Habits of Some Hymenopterous Egg-parasites of Orthoptera and Mantoidea, 195.

Brues, C. T. Note on the Ichneumonid Genera Cyanocryptus and Lamprocryptus, 191.

Cockerell, T. D. A. Arthropods in Burmese Amber, 40.

Cockerell, T. D. A. New Social Bees, 120.

Gibson, E. H. Key to the Species of Leptoglossus Guér. Occurring North of Mexico (Heteroptera; Coreidæ), 69.

Girault, A. A. The North American Species of Pachyneuron with Three New Species (Chalcid-flies), 88.

Girault, A. A. New Miscellaneous Chalcid-flies from North America, 91.

Girault, A. A. A New Species of the Genus Mymar from the Woods of Maryland with an Important Descriptive Note, 99.

Girault, A. A. A Metallic Species of Cirrospilopsis from Maryland (Hymenoptera, Eulophidæ), 100.

Glaser, R. W. Anthocyanin in *Pterocomma smithiæ*, 30.

Glaser, R. W. The Growth of Insect Blood Cells in Vitro, 1.

Howard, L. O. An Interesting Manuscript, 87.

Howe, R. H. Distributional Notes on New England Odonata, 45.

Hungerford, H. B. The Life-history of *Mesovelia mulsanti* White, 73.

Johnson, C. W. A New Species of Criorhina from New England, 153.

Ludlow, C. S. Cycloleppteron Theobald (Diptera: Culicidæ), 53

Mac Gregor, E. A. Eight New Mallophaga of the Genus Lipeurus from North American Birds, 105.

Marchand, W. The Specific Differences between *Apantesis nais* Drury, *A. vittata* Fabr. and *A. phalerata* Harris, 59.

Marchand, W. Notes on the Habits of the Snow-fly (Chionea), 142.

Osborn, Herbert, and C. J. Drake. Notes on Tingidæ, 155.

Parshley, H. M. Notes on North American Tingidæ (Hemiptera), 13.

Parshley, H. M. Note of Correction (Hemiptera), 164.

Shinji, G. O. Notes on Aphids, 84.

Smith, H. E. Notes on New England Tachinidæ, with the Description of One New Genus and Two New Species, 54.

Smith, H. E. Five New Species of North American Tachinidæ, 137.

Smith, H. S. The Habit of Leaf-oviposition among the Parasitic Hymenoptera, 63.

Swett, L. W. Geometrid Notes, 190.

Van Duzee, M. C. Descriptions of a Few New Diaphorus from the Western States (Diptera), 33.

Wheeler, W. M. The North American Ants Described by Asa Fitch, 26.

Wheeler, W. M. A New Malayan Ant of the Genus Prodiscothyrea, 29.

Wheeler, W. M. The Temporary Social Parasitism of *Lasius subumbratus* Viereck, 167.

Wheeler, W. M. Notes on the Marriage Flights of Some Sonoran Ants, 177.

Wheeler, W. M. The Pleometrosis of Myrmecocystus, 180.
Wilcox, A. M. Notes on Rearing Insects for Experimental Purposes and Life-history Work, 7.

INDEX TO SUBJECTS.

(New genera, new species and new names in boldface type.)

Abies balsami, aphids on, 86.
Acalypta lillianis, 14.
Acanthomyops, 175.
Achrysocharella pulchrella 94.
Allophorocera montana 140.
Alveotingis, 24.
Alveotingis grossocerata, 20, 25.
Amber fossils, 40.
Anaphoidea conotracheli, 93.
Anthocyanin in Pterocomma, 30.
Ants, marriage flights, 177.
Apantesis nais, 58.
Apantesis phalerata, 58.
Apantesis vittata, 58.
Apensia electriphila, 44.
Aphidencyrtus aspidioti, 95.
Aphids, notes on, 84.
Atoposomoidea ogimæ, 95.
Atta versicolor, 179.
Blattidæ, fossils in amber, 40.
Blepharipa scutellata, 63.
Blood cells of insects, growth in vitro, 1.
Bombus incertus, 121.
Bombus lapidarius, 121.
Bombus niveatus callophenax, 122.
Bombus terrestris fulvocinctus, 121.
Bombus terrestris simlaënsis, 121.
Bombus tunicatus, 121.
Bothriomyrmex decapitans, 173.
Burmese amber fossils, 40.
Camponotus caryæ, 27.
Camponotus caryæ brunni, 29.
Camponotus caryæ clarithorax, 28.
Camponotus caryæ fallax , 27.
Camponotus caryæ cnemidatus, 28.
Camponotus caryæ decipiens, 28.
Camponotus caryæ discolor, 28.
Camponotus caryæ fallax, 28.
Camponotus fallax nearcticus, 28.
Camponotus herculeanus ligniperda, 28.
Camponotus caryæ himalayanus, 29.
Camponotus caryæ kamensis, 29.
Camponotus caryæ lameerei, 29.
Camponotus ligniperdus pictus, 27.
Camponotus maculatus æthiops, 27.
Camponotus marginatus, 28.
Camponotus marginatus nearcticus, 27, 28.
Camponotus minutus, 28.
Camponotus nawai, 29.
Camponotus novæboracensis, 27.
Camponotus pardus, 28.
Camponotus paucipilis, 28.
Camponotus pavidus, 28.
Camponotus quadrinotatus, 29.
Camponotus rasilis, 28.
Camponotus ruzskyi, 29.
Camponotus subbarbatus, 28.
Camponotus tanquaryi, 28.
Camponotus vitiosus, 29.
Cecidomyia betulæ, parasite of, 93.
Cecidomyidæ, fossil in amber, 40.
Chætogædia monticola, 63.
Chaitophorus coleoptis, 86.
Chalcid-flies from North America, 91.
Cheyletus burmiticus, 41.
Chionea, habits of, 142.
Chionea araneoides, 142.
Chionea crassipes, 142.
Chionea scita, 143.
Chionea valga, 142.
Chrysopa, eggs parasitized by Perilampus, 67.
Cirrospilopsis metallicus, 100.
Closterocerus vau, 101.
Corrections to paper by H. M. Parshley, 164.
Compsilura concinnata, 57.
Corythucha, 15.
Craponius inæqualis, parasite of, 93.
Criorhina intermedia, 153.
Criorhina nigriventris, 154.
Criorhina verbosa, 154.
Crossocosmia sericariæ, 63.
Cryphalites rugosissmus, 43.
Cyanocryptus, 191.
Cyanocryptus chalybeus, 193.
Cyanocryptus fulgidus, 193.
Cyanocryptus kinbergi, 193.
Cyanocryptus metallicus, 191, 192.
Cyanocryptus sericeus, 193.
Cycloleppteron, 53.
Dendrolasius fulginosus, 168.
Dermestes larvalis, 43.
Diaphorus adustus, 35.
Diaphorus californicus, 33.
Diaphorus contiguus, 35.
Diaphorus gibbosus, 36.
Diaphorus inornatus, 38.
Diaphorus junctus, 35.
Diaphorus lamellatus, 34.
Diaphorus nudus, 34.

Diaphorus opacus, 35.
Diaphorus snowii, 36.
Diaphorus sparsus, 36.
Diaphorus spectabilis, 37.
Diaphorus variabilis, 39.
Diaphorus vulsus, 39.
Diaulinopsis, 95, 100.
Dibrachys clisocampæ, 92.
Dibrachys nigrocyaneum, 88.
Dioctria albius, 117.
Dioctria brevis, 117.
Dioctria flavipes, 119.
Dioctria longicornis, 118.
Dioctria longicornis var tibialis, 118.
Dioctria media, 118.
Dioctria pleuralis, 118.
Dioctria pusio, 119.
Dioctria rubidus, 119.
Dioctria sackenii, 119.
Elateridæ, fossil in amber, 40.
Electrofænus gracilipes, 41.
Empididæ, fossil in amber, 40.
Encyrtus siphonophoræ, 102
Enicocephalidæ, fossil in amber, 40.
Enicocephalus swinhoei, 42.
Eohyria, 57.
Ephebomyrmex imberbiculus, 178.
Eupeleteria magnicornis, 63.
Euplectrus platypenæ, 91.
Eutelus betulæ, 93.
Eutelus salicis, 94.
Evaniidæ, fossil in amber, 40.
Exchange column, 31, 61, 103, 136, 165, 197.
Exorista spinipennis, 58.
Exoristoides slossonæ, 58.
Fenestrella, 14.
Fenestrella ovata, 155.
Fir, aphids on, 86.
Formica atra, 28.
Formica caryæ, 26, 27.
Formica ligniperda, 26, 27.
Formica herculeana, 26, 27.
Formica novæboracensis, 26.
Formica subsericea, 26, 27.
Formicina subrumbratus, habits, 167.
Fossil Arthropods, 40.
Galeatus peckhami, 15.
Gastrophilus hæmorrhoidalis, 182.
Gastrophilus intestinalis, 183.
Gastrophilus nasalis, 183.
Geometridæ, notes on, 190.
Gonatocerus illinoiensis, 91.
Grotiusomyia flavicornis, 95.
Habrocytus onerati, 94.
Hæmatopinus eurysternus, 187.
Hentz, manuscript of, 87.
Hesperotingis, 21.
Hesperotingus antennata, 21.
Hesperotingis antennata, var borealis, 24.
Hesperotingis fuscata, 24.
Homœonychia rapæ, 139.
Horisme vitalbata incana, 190.
Insect blood cells, growth in vitro, 1.
Lamprocryptus, 192.
Lampropholis, fossil in amber, 40.
Lamprostatus canadensis, 96.
Lasius fuliginosus, 168.
Lasius sitkænsis, 172.
Lasius umbratus, habits, 167.
Lasius subumbratus, habits, 167.
Leaf-oviposition in parasitic Hymenoptera, 63.
Lepidosaphes ulmi, parasites of, 95.
Lepidoscelio viatrix, 196.
Lepismatidæ, fossil in amber, 40.
Leptobyrsa rhododendri, 15.
Leptoglossus, key to North American species, 69.
Leptoglossus ashmeadi, 72.
Leptoglossus clypealis, 71.
Leptoglossus corculus, 71.
Leptoglossus fulvicornis, 70.
Leptoglossus gonagra, 72.
Leptoglossus occidentalis, 71.
Leptoglossus oppositus, 71.
Leptoglossus phyllopus, 72.
Leptoglossus zonatus, 72.
Leptophya costata, 16.
Lice, control of, 187.
Linognathus vituli, 188.
Liometopum apiculatum, 177.
Lipeurus aberrans, 112.
Lipeurus baculus, 109.
Lipeurus brevicephalus, 105.
Lipeurus bishoppi, 111.
Lipeurus clavatus, 115.
Lipeurus constrictus, 111.
Lipeurus crotophagæ, 105.
Lipeurus docophoroides, 112.
Lipeurus habrœus, 105.
Lipeurus introductus, 115.
Lipeurus lineatus, 114.
Lipeurus macgragori, 106.
Lipeurus mississippiensis, 107.
Lipeurus picturatus, 106.
Lipeurus snodgrassi, 108, 115.
Lipeurus squalidus, 111.
Lipeurus stramineus, 108.
Lipeurus temporalis, 111.
Lipeurus texanus, 109.
Lipeurus toxoceros, 105.
Lipeurus variabilis, 114.
Lydella nigripes, 141.
Lygæidæ, synoptis key of genera, 128.

Mallophaga, new North American, 105.
Marriage flights of ants, 177.
Masicera celer, 138.
Megorismus lasiopteræ, 97.
Megorismus poloni, 97.
Melanorhopola clavata, 17, 159.
Melanorphopala duryi, 17, 19, 159.,
Melanorhopala infuscata, 19.
Melanorhopala slossoni, 24.
Melanorhopala, key to species, 18.
Melanorhopola lurida, 18, 160.
Melanorhopola uniformis, 18, 160.
Mesovelia mulsanti, life-history of, 73.
Miscogaster abnormicola, 96.
Miscogaster biguttata, 97.
Miscogaster flora, 96.
Mœllerius versicolor, 179.
Monogyny, 180.
Monomorium pharaonis, 26.
Monomorium salomonis, 173.
Mosquitoes of America (review), 161.
Mymar cincinnati, 99.
Mymar tyndalli, 100.
Mymar venustum, 99.
Myrmecocystus, habits, 180.
Myrmica cerasi, 26.
Myrmica molesta, 26.
Nectarosiphum rubicola, 84.
Neomphaloides cincinnatus, 92.
Neomymar, 100.
New England Odonata, 45.
Nose-fly, distribution in U. S., 182.
Odonata of New England, 45.
Olivier, copy of manuscript by, 87.
Orsillacis, 129.
Oviposition in parasitic Hymenoptera, 63.
Pachyneuron, North American species of, 88.
Pachyneuron albutius, 88.
Pachyneuron allograptæ, 89.
Pachyneuron altiscuta, 89.
Pachyneuron anthomyiæ, 89.
Pachyneuron aphidivorum, 102.
Pachyneuron californicum, 90.
Pachyneuron hammari, 89.
Pachyneuron maidaphids, 102.
Pachyneuron micares, 102.
Pachyneuron nigrocyaneum, 88.
Pachyneuron siphonophoræ, 90.
Pachyneuron syrphi, 88.
Pachyneuron texanum, 90.
Pachyneuron virginicum, 89, 90.
Palæocampa, 41.
Pales pavida, 63.
Parasitic Hymenoptera, habit of leaf-oviposition, 63.
Parshley, corrections to paper by, 164.
Pelatachina pellucida, 57.
Perilampus chrysopæ, oviposition of, 66.
Perilampus hyalinus, oviposition of, 64.
Phoresy in parasitic Hymenoptera, 196.
Phthorimæa operculella, parasite of, 92.
Physatocheila, 17.
Physatocheila, key to Nearctic species, 155.
Physatocheila major, 158.
Physatocheila parshleyi, 156.
Physatocheila plexa, 156.
Physatocheila variegata, 156.
Pilatea ruficornis, 138.
Pilatea unicolor, 137.
Pleometrosis in Myrmecocystus, 180.
Pogonomyrmex barbatus molefaciens, 178.
Pogonomyrmex barbatus rugosus, 178.
Pogonomyrmex imberbiculus, 178.
Polynema bifasciatipenne var. varium, 92.
Polyxenes burmiticus, 40.
Polygyny, 180.
Prenolepis imparis, 179.
Prodiscothyrea bryanti, 29.
Propachyneuronia, 102.
Propachyneuronia aphidivorum, 102.
Propachyneuronia maidaphidis, 102.
Propachyneuronia micans, 102.
Propachyneuronia siphonophoræ, 102.
Pseudiglyphomyia marilandica, 91.
Pseudotachinomyia, 54.
Pseudotachinomyia webberi, 54.
Psilopteryx zimmeri, 143.
Psychodidæ, fossil in amber, 40.
Pterocomma smithiæ, 30.
Rearing insects, methods, 7.
Rhipiphoridæ, fossil in amber, 40.
Rubus parviflorus, aphids on, 85.
Sciara, fossil in amber, 40.
Sciasma frontalis, 56.
Scleroderma tuberculatum, 44.
Scleroderma luteicolle, 44.
Scleroderma quadridentatum, 43.
Snow-fly, habits of, 142.
Trigona atomaria, 127.
Trigona beccarii jombenensis, 123.
Trigona bilineata, 127.
Trigona bipunctata, 127.
Trigona branneri, 125.
Trigona clavipes, 126.
Trigona curriei, 123.
Trigona fericauda, 127.
Trigona flaveola, 126.
Trigona flavocincta, 127.
Trigona frontalis, 126.
Trigona goeldiana, 127.
Trigona lineata, 126.
Trigona magrettii, 123.

Trigona medioruf a, 124, 125.
Trigona mellea, 124.
Trigona mellicolor, 124.
Trigona mirandula, 122.
Trigona molesta, 126.
Trigona musarum, 123.
Trigona nitidula, 126.
Trigona opaca, 126.
Trigona pachysoma, 125.
Trigona pallida, 124.
Trigona perangulata, 125.
Trigona postica, 125.
Trigona remota, 126.
Trigona salvataris, 124, 125.
Trigona tataira, 124.
Trigona tataira friesiella, 124.
Trigona zonata, 123.
Social parasitism of Lasius, 167.
Sodium flouride as insecticide, 187.
Solenopsis debilis, 26.
Solenopsis fugax, 26.
Solenopsis molesta, 27.
Spathimeigenia nigriventris, 139.
Stephanitis, 16.
Tachinidæ, new species of, 137.
Tapinoma erraticum, 173.
Thermotropism in Chionea, 149.
Thimbleberry, Aphids on, 85.
Tingidæ, North America, 13.
Trichodectes scalaris, control, 187.
Trichomyia, fossil in amber, 40.
Trigonalys, fossil in amber, 40.
Trydymus æneicornis, 98.
Trydymus gargantua, 98.
Trydymus poloni, 98.
Trydymus robiniæcola, 98.
Wheeleriella santschii, 173.
Winnertziola burmitica, 42.
Zelus audax, 15.
Zelus socius, 15.
Zygobothria nidicola, 63.

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